4.3 Alternative 2

Natural Environment (4.3.1)

EARTH (4.3.1.1)

Analysis of Alternative 2 indicates the area available for timber harvesting is reduced to approximately 8,016 acres. In addition, there are approximately 3,577 acres mapped as unstable areas (Watershed Analysis ARSs 1,2,3 and 4) where harvesting will be either prohibited or significantly restricted by Watershed Analysis prescriptions. Any harvest proposed on the 1,150 acres that are mapped as potentially unstable would be evaluated by slope-stability specialists; these specialists would help determine the harvest prescriptions. The area in riparian buffers increases to approximately 990 acres and the acres of wind buffers remains the same at approximately 18 acres. 1,942 acres are identified as potentially inaccessible to harvesting under this alternative due to limitations on road construction. Average annual acres harvested is reduced to 43 acres of regeneration harvesting and 35 acres of thinning.

About 39 miles of new road will be constructed during approximately the next 60 years. No road construction will occur on unstable slopes and 0.1 miles of road would be constructed on areas mapped as potentially unstable over the 60 year period.

Impacts on Slope Stability

The potential for impacts to slope stability from road construction is greatly reduced under this alternative because no road construction will occur on unstable slopes and only 0.1 mile of road construction on potentially unstable slopes is anticipated over approximately 60 years. The nature of the impacts would be similar to Alternative 1.

Root structure remaining in stumps after timber harvest activities would decompose over time and, to the degree that the root structure is not replaced by new vegetation, the capacity of root structure to hold near-surface soils in place would be reduced. This reduction in root structure could result in debris slides and surface erosion on potentially unstable slopes, particularly where mineral soil is exposed. Sediment from these events likely would be delivered directly to stream channels and down gradient to fish habitat. This potential impact is mitigated by the use of specialists to design and evaluate harvest activities on potentially unstable slopes. No harvesting will occur on areas showing signs of instability. The probability of failures occurring is also further reduced by the reduction of regeneration harvest acres to an average of 43 acres annually.

Regeneration harvests in stands of conifer timber will increase the amount of water entering soils during relatively infrequent combinations of climatic conditions commonly referred to as rain-on-snow events. Harvested areas would remain susceptible to such soil-water increases until a forest canopy becomes re-established. The potential for harvesting to increase soil-water levels during rain-on-snow events is significant; however, the slope-stability consequence of increasing soil water is largely dependent on site-specific topographic, soils, geology, and vegetation conditions. The likelihood that a specific area within the watershed will experience a rain-on-snow event increases with elevation and is greatest above about 1700 feet.

The potential for future slope failures affected by rain-on-snow events has been substantially mitigated in this alternative by adherence to Watershed Analysis prescriptions that limit harvesting on areas where slope failures have occurred historically and the reduction in amount of regeneration harvesting.

Harvesting on the mapped unstable slope areas is significantly limited by the Watershed Analysis prescriptions, which are designed to prevent or avoid slope failures that would impact water quality or fish resources. However, shallow rapid slope failures could occur in the identified unstable areas, resulting in sedimentation to down-slope streams. No probable significant impacts to slope stability are expected from harvest activities under this alternative.

Impacts on Erosion

Surface erosion from exposed slopes associated with road construction would be reduced under this alternative due to the reduction by one third of the amount of new road construction. The mitigation described in Alternative 1 is also applicable to this alternative.

Cumulative Impacts

The cumulative impacts from implementation of this alternative would be much reduced from Alternative 1. Most of the sediment deliverable to public resources would originate from existing roads within the area. These adverse impacts are not considered to be significant.

Additional Mitigation Measures

Paving roads and drainage ditches to reduce erosion could further reduce sediment from roads.

Unavoidable Adverse Impacts

Road and landing construction activities would result in short-term increases in sediment production, even if potential impacts were mitigated.

AIR (4.3.1.2)

Climate/Air Quality

Short-term impacts only, similar to Alternative 1, although the potential for impacts is lower due to reduced level of harvest activities.

WATER (4.3.1.3)

Surface Water and Groundwater Quality

Alternative 2 differs from Alternative 1 in terms of surface water quality by the addition of a few more mitigation measures. One of these is leaving buffers on the smaller Type 5 streams. For perennial streams, there will be more protection of water temperature. However, many of these streams are seasonal and are dry in the summer when water temperature is a concern. The buffers will help to reduce the amount of sediment entering the streams during and immediately following logging by preventing soil disturbance within the riparian areas. If there is a surface erosion source near a stream, the buffers will serve as a sediment filter.

This alternative calls for greater scrutiny by a qualified specialist concerning potentially unstable slopes. No road construction and limited reconstruction of existing roads will be allowed on slopes determined to be unstable. Consequently the risk of adding more sediment to surface waters because of mass wasting is reduced to some extent. The potential for impacts from roads is also reduced because about a third less road miles will be constructed than under Alternative 1.

Surface Water and Groundwater Quantity

This alternative does not have any additional mitigating measures specifically for surface water quantity. However, additional mitigation for protecting surface water quality causes fewer acres to be harvested and fewer road miles to be constructed than what would be done under Alternative 1. Therefore, increases in water yield and peak flows will be slightly less.

Public Water Supply

Alternative 1 is already unlikely to adversely affect the public water supply. However, the risk of sediment and phosphorus loading above natural background

levels into Lake Whatcom is less under this alternative than under the Alternative 1.

PLANTS AND ANIMALS (4.3.1.4)

Forest Vegetation: Upland, Riparian, Wetland

Upland Vegetation: General Forest Ecology Perspective

Short-term Impacts: Direct and Indirect

In the first ten years, there is little appreciable difference between Alternative 2 and Alternative 1 in terms of the existing ratios of forest stand conditions. In Alternative 2 during the first decade, there would be 3% less area in the open, regeneration and pole classes combined, compared with Alternative 1. This difference is probably not statistically significant, and as the proportion of forest area in the closed, complex and fully functional classes would stay virtually the same in the first decade, direct impacts would remain essentially the same as described for alternative 1.

Short-term indirect impacts would be the same as those under Alternative 1. Ecological factors resulting from a forest dominated by stands in the "closed" condition would not change appreciably within the first decade.

Long-term Impacts: Direct

At about 50 years, differences between Alternatives 1 and 2 become more readily apparent. Alternative 2 would have less forest in the pole stage and more in the regeneration stage compared with alternative 1. For the three youngest age classes combined, there would be only a 5% difference between Alternatives 1 and 2. 39% would be in a closed condition in Alternative 2 compared with 24% for Alternative 1.

At 100 years, the differences are more striking, with 14% of the forest in the younger age classes in Alternative 2, compared to 27% for Alternative 1. The highest age classes are more substantially represented in Alternative 2, with the fully functional class representing 44% of the forested area, compared to 30% for Alternative 1.

While there are differences, there are no "standards" for the amount of forest that should be in each age class across a landscape to ensure a robust forest ecosystem; nor what the patterns of that mix should be.

Long-term Impacts: Indirect

As the forest matures, and more area is in the older age classes, structural diversity increases as result of canopy gaps left by fallen trees, shade tolerant trees of different ages and sizes growing up through the understory and lower canopy, snags and logs lying on the forest floor.

Cumulative Impacts

As with Alternative 1, cumulative impacts will be related to frequency of entry into the stands for forest practices activities. Cumulative impacts may be slight on non-compactable soils, when vegetation has time to recover between entries. On compactable soils, if rotation ages are too short to allow soils and vegetation to rebound, productivity could diminish over time, and with it the rate of forest succession. While possible, such impacts are not probable.

Additional Mitigation Measures

Mitigation would be the same as for alternative 1.

Unavoidable Adverse Impacts

There would be 22 fewer new road miles with Alternative 2, resulting in fewer impacts related to reduction of forested area, increase of forest edge, removal of thermal cover and sediment transport.

Riparian and Wetland Vegetation: General Forest Ecology Perspective

Short-term Impacts: Direct and Indirect

Since all streams would be buffered, Alternative 2 could reduce the immediate, short term impacts on those streams that were located on timber sales harvested in the first decade. Such impacts might include benefits due to reduced disruption of soils, vegetation and hydrology, and thermal relationships. Because many small wetlands (that are not specifically protected under either Alternative 1 or Alternative 2) are associated with type 5 streams, they would likely also receive protection, by falling within the buffers of the type 5 streams. More restrictions on unstable slopes could also benefit wetlands and riparian areas, by potentially avoiding landslides that could dam, bury, or dump sediment and debris into them.

Alternative 2 would reduce impacts on the ecology of more localized ecosystems around Type 5 streams and their associated wetlands that occur on timber sales harvested in the first decade, and possibly for some streams and wetlands downslope of unstable areas where timber harvest is occurring.

Long-term Impacts: Direct and Indirect

Long-term benefits for riparian areas would be the same as short term direct impacts, but would apply for all riparian areas, not just those harvested within the first decade of plan implementation. In addition, the older age classes in the forest would contribute large down woody debris to riparian areas and wetlands, creating sediment barriers, influencing water and channel morphology though wetlands and small streams, and holding moisture during dry parts of the year.

Water temperatures and sediment loads could possibly be reduced and water levels stabilized as result of buffers on headwater streams. Buffers would protect riparian and associated wetland vegetation and soils, preserving the floodpeak attenuation and filtration functions of wetlands within the riparian areas. It is possible that the streams downstream, into which the headwater streams feed, could also experience more stable temperatures, less sedimentation, lower storm flows and higher summer flows as wetlands associated with tributaries would be receiving more protection. The extent of benefits would depend on the number of wetland acres protected by these riparian buffers. Down logs contributed through mortality of older, large trees would have a long-term impact on water routing and channel morphology, sediment detention, and vegetation establishment.

No significant adverse impacts are identified at the broader level of forest ecology. More site-specific impacts are evaluated in other sections.

Cumulative Impacts

The difference between Alternatives 1 and 2 in terms of cumulative effects is that the riparian areas of headwater streams and a few small wetlands associated with them would receive some protection through the buffers provided by Alternative 2. This may contribute to the overall functional stability of the forest, but there is insufficient information to truly evaluate this difference. For isolated wetlands, cumulative effects would be the same as for Alternative 1.

Additional Mitigation Measures

Mitigation for impacts to small wetlands is the same as for Alternative1, and could most ideally be accomplished through avoidance. Effort could-be made whenever possible to locate wetlands that are too small to show up on aerial photos (generally wetlands under .25 acres). This can sometimes be accomplished by looking at soil maps and topographical maps for clues to potential hydric soils and topography, and verifying conditions on the ground. When small wetlands are located, leave trees could be clumped around them;

and sale design can be used to ensure yarding through them is avoided whenever possible to protect wetland vegetation and soils.

Unavoidable Adverse Impacts

Some small wetlands and headwater streams are undetectable using standard office procedures, due to their size and topographical position. These will suffer impacts due to logging activity in and around them, ranging from short-term loss of function to long-term loss of acreage and function. While this may occur at small sites, it is unlikely this will occur frequently enough for this to have significant adverse affects on the overall functioning of the forest ecosystem.

Forest Health: Insects and Disease

Short-term Impacts: Direct and Indirect

Due to increased riparian buffers and potential for more areas to be considered unstable, Alternative 2 will likely result in increased forest insect and disease activity relative to Alternative 1 due to the general maturation of the forest and reduced opportunity to enter and manipulate tree vigor and stand composition (approximately 90 acres treated per year vs. approximately 150 acres treated per year). These insect and disease activity levels will not threaten ecosystem function. Logs and snags will increase, potentially to the benefit of water quality and soil productivity. Over time stands will shift toward late seral conditions, becoming more prone to insect and disease activity; however, not at a level of significant adverse impact.

Long-term Impacts: Direct and Indirect

None are expected.

Cumulative Impacts

None are expected. Also, Alternative 2 provides some capacity for land managers to prevent and respond to pest activity, albeit less than Alternative 1, but likely sufficient to prevent major adverse indirect effects to adjacent lands

Additional Mitigation Measures

In areas where people work, concentrate, or recreate, risks from hazardous trees and snags could be evaluated and monitored. Mitigation actions can be taken to reduce safety risks.

Unavoidable Adverse Impacts
None identified.

Rare and Sensitive Plants

As explained in Alternative 1, it is unlikely that the forest practices activities represented by any of the alternatives would have much impact on *Lobelia dortmanna* in Lake Whatcom. Alternatives 2-5 would further reduce nutrient inputs to the lake due to buffering of headwater streams.

Animals (*Habitat Availability - quality, quantity, accessibility)*

The same species-by-species protection identified under Alternative 1 applies to Alternative 2-4.

Short- and Long-term Impacts: Direct and Indirect

Short-term direct impacts of Alternative 2 would be similar to those of Alternative 1, with the exception that road construction and regeneration harvest would be limited or restricted in more areas of the planning area. Fewer areas would be impacted by the removal of forest cover. In addition, fewer areas would experience the short-term indirect impacts of loss of existing snags, "edge effect", and "road effects". Compared to Alternative 1, Alternative 2 would also be expected to improve short-term and long-term protection of amphibian habitat (especially for the tailed frog and other species that use headwater streams), due to the consistent application of buffers on type 5 streams. (Corn and Bury, 1989; Jackson, 2002; Jackson, et.al., 2001; Kauffman, et.al., 2001; O'Connell, et.al., 1993.)

Suitable and primary habitats are projected to change over time as follows:

Table 16: Habitat Change under Alternative 2 relative to Selected Life Forms.

Life Form	Habitat Type[1]	2001	2005	2010	2050	2100	2150	2200
8	Suitable	60	65	58	61	58	55	55
	Primary	31	31	26	24	17	13	10
10	Suitable	87	92	84	93	97	95	97
	Primary	86	86	79	87	94	92	95
11	Suitable	93	93	90	93	97	96	97
	Primary	86	86	79	87	94	92	95

[1] **Primary habitat** - A preferred or optimal habitat that predictably supports the highest population density of a species; that habitat upon which a species is essentially dependent for long-term population maintenance.**Secondary habitat** – A habitat that is used by a species, but is clearly less suitable than primary habitat, as indicated by a lower population density or less frequent use. A habitat may be designated as secondary where it is known to be used by a species but data are insufficient to clearly identify it as a primary habitat.

13	Suitable	72	80	77	86	90	92	95
	Primary	58	67	64	75	82	85	90
14	Suitable	79	83	82	87	91	93	95
	Primary	58	67	64	75	82	85	90

Under Alternative 2, Life Form 8 would experience a short-term decline in its suitable and primary habitats (from 60/31% to 58/26% in approximately 10 years). Life Form 8 would experience a long-term decline in suitable and primary habitats (as well as a short-term decline), going from 60/31% to 55/10% in approximately 200 years. There is greater loss of Life Form 8's habitat under Alternative 2 than Alternative 1.

As with Alternative 1, Life Forms 10 and 11 are expected to have a short-term decrease in habitat under Alternative 2, with a "rebound" after approximately 50 years. The long-term trend for Life Forms 10 and 11 is slightly different under Alternative 2 compared to Alternative 1. Both suitable and primary habitat is projected to increase for Life Form 10 (rather than primary habitat decreasing slightly, as it is expected to do under Alternative 1). Life Form 11 is expected to have a long-term increase in both types of habitat, as well, from 93/86% to 97/95% (compared to a long-term decline under Alternative 1).

Life Forms 13 and 14 are expected to have slightly higher short-term increases in both habitats compared to Alternative 1. Life Form 13 is predicted to go from 72/58% to 77/64% under Alternative 2, vs. 73/61% under Alternative 1. Life Form 14 is predicted to go from 79/58% to 82/64% vs. 80/61%. Life Forms 13 and 14 show much larger long-term projected increases in habitat under Alternative 2 than under Alternative 1. After approximately 200 years, habitat for Life Form 13 is expected to go from 72/58% to 95/90% (vs. 7l9/64% under Alternative 1), and habitat for Life Form 14 is expected to go from 79/58% to 95/90% (vs. 82/64% under Alternative 1).

A long-term direct impact of Alternative 2 would be a greater decline (than for Alternative 1) in early seral stages on the landscape, and a more pronounced shift to mature forests (closed and complex seral stages, with a slightly higher increase in "old-growth", or "fully functional" seral stage). After approximately 200 years, due to the small number of acres harvested each year, there would be almost no "open" seral stage on state trust lands in the planning area. There would also be about half as much young forest at that time under Alternative 2 as there would be under Alternative 1 (see Table X5, Appendix D).

Compared to Alternative 1, there is greater loss of younger seral stage habitats (e.g., for Life Form 8). However, Alternative 2 retains more undisturbed areas for older forest interior species.

Cumulative Impacts

The cumulative effects from road building will be less for some areas under than Alternative 1. Because of potentially unstable slopes (and resulting "potentially inaccessible" areas), there would be the potential for large blocks of contiguous forest to remain unaltered, or possibly only slightly altered (depending on the types of management activities that might be approved by the inter-jurisdictional committee in these areas). These areas are most likely to occur in the northeast and southwest portions of the planning area (see Map 2, Appendix C). This could result in a higher degree of habitat suitability for interior forest species, compared to Alternative 1.

It is predicted that there would be considerably less road construction under Alternative 2 (roughly 39 miles on DNR ownership) vs. Alternative 1 (roughly 61 miles). The areas most notably spared from road impacts, compared to Alternative 1, would include the eastern (mid) portion, as well as the southwestern and southeastern portions.

Other cumulative impacts listed under Alternative 1 would also be expected to occur to a lesser extent under Alternative 2.

Additional Mitigation Measures

Same as Alternative 1, although less mitigation would be needed due to fewer acres being harvested and fewer road.

Unavoidable Adverse Impacts

Unavoidable adverse impacts are similar to Alternative 1 for Alternative 2, except that they would likely be to a lesser extent.

Fish

Habitat Quality

Alternative 2 differs from Alternative 1, relative to fish habitat by having RMZs on Type 5 waters and requiring additional attention to potentially unstable slopes. These will both benefit fish habitat.

Alternative 2 is more protective of mass-wasting problems from timber harvest and road construction on unstable slopes than Alternative 1 because it provides careful regulation of timber harvest and road construction on potentially unstable slopes and provides additional RMZ protection on all Type 5 waters.

Riparian ecosystem function throughout the river continuum is more completely protected under Alternative 2 than under Alternative 1 due to the addition of RMZ protection for Type 5 waters.

Alternative 2 wind buffers are the same as Alternative 1, and like that alternative they will help maintain the integrity of the riparian ecosystem.

Under Alternative 2, logging road construction related to unstable slopes will receive closer scrutiny. Activities proposed on potentially unstable slopes will be reviewed by an inter-jurisdictional committee, who may make site-specific recommendations. "High hazard" and "moderate hazard" mass-wasting units, as defined by the Lake Whatcom Watershed Analysis Procedure, will be avoided.

Short- and Long-term Impacts: Direct and Indirect

RMZ widths on Type 5 waters provide limited protection from upslope disturbances. This small RMZ will provide streambank stability and sediment filtering for low to moderate intensity storm events, but may not completely filter out sediment from slope failures, and maintain natural levels of LWD, detrital inputs and water temperatures. Under Alternative 2, the HCP-driven study about protecting Type 5 waters would continue.

Cumulative Impacts; Mitigation

See Alternative 1.

Unavoidable Adverse Impacts

Alternative 2 is similar to Alternative 1. Alternative 2 provides closer attention to road construction on unstable slopes. While sediment run-off will still occur, it will be less due to fewer miles of road in unstable areas.

Habitat Accessibility

Same as Alternative 1.

ENERGY AND NATURAL RESOURCES (4.3.1.5)

Energy Resources

Coal

Short-term Impacts

No change from Alternative 1.

Long-term Impacts

There is no current coal activity in the landscape planning area. Long term direct or indirect impacts could occur if leasing were to proceed in the future. Any proposed activity in areas of unstable slopes would be regulated under the HCP, Forest Practices rules, and Forests and Fish.

Cumulative Impacts

There is no current coal activity in the landscape planning area. Cumulative impacts could occur if leasing were to proceed in the future. Any proposed activity in areas of unstable slopes would be regulated under the HCP, Forest Practices rules, and Forests and Fish.

Additional Mitigation Measures

No change from Alternative 1.

Unavoidable Adverse Impacts

No change from Alternative 1.

Oil and Gas

Short-term Impacts

Potential impacts could occur from the active lease (in the W1/2 of Section 28, T38N, R4E). Access road, drill site development or other activity on portions of the lease designated as unstable slopes would be carefully regulated under the HCP, Forest Practices rules, and Forests and Fish. However, no activity has been proposed to date. Otherwise, there is no change from Alternative 1.

Long-term Impacts

There are no long term direct impacts from oil and gas activity within the landscape planning area as there is a no-surface drilling policy for new leases on state land within the planning area.

Cumulative Impacts

Cumulative impacts from oil and gas activity within the landscape planning area could occur, related to exploration activity on fee minerals. Activity could include access road construction and road maintenance. Access across DNR roads also could be requested.

Additional Mitigation Measures

No change from Alternative 1

Unavoidable adverse impacts

Potential impacts could occur from the active lease in the W1/2 of Section 28, T38N, R4E. Any proposed exploration activity on portions of the lease designated as unstable slopes would be regulated under the HCP, Forest Practices rules and Forests and Fish. Access road use or construction or other non-drilling surface activity would be carefully regulated. However, no activity has been proposed to date. Otherwise, there is no change from Alternative1.

Hydropower

There are no current or potential hydropower resources within the landscape planning area, and, therefore, no short or long term impacts, no cumulative impacts, no mitigation changes from Alternative 1, and no unavoidable adverse impacts.

Mineral resources

Sand, gravel and rock

Short- and Long-term Impacts: Direct and Indirect

There are no short-term direct impacts (see Alternative 1). Borrow pit or other sand gravel or rock activity, or access road construction would be carefully regulated under the HCP, Forest Practices rules, and Forests and Fish.

There are no long-term direct or indirect impacts (see Alternative 1).

Cumulative Impacts

Cumulative impacts are the same as Alternative 1. Borrow pit or other sand, gravel or rock activity, or access road construction would be carefully regulated under Objective 1 of this alternative. This will minimize cumulative impacts from this activity.

Additional Mitigation Measures

Sand, gravel and rock: Borrow pit or other sand, gravel or rock activity, or access road construction would be carefully regulated under the HCP, Forest

Practices rules, and Forests and Fish. This will mitigate potential impacts from these activities.

Unavoidable Adverse Impacts

Sand, gravel and rock: Borrow pit or other sand, gravel or rock activity, or access road construction would be carefully regulated under the HCP, Forest Practices rules, and Forests and Fish. This will mitigate potential impacts from these activities.

Metallic minerals

No change from Alternative 1.

Industrial Minerals

No change from Alternative 1.

Forest Resources

Timber Resources

Under this alternative, approximately 51 percent will be available for harvest. The annual harvest is about half of Alternative 1.

Short-term Impacts: Direct and Indirect

Sufficient acreage and volumes would be available to support immediate harvest operations. Lack of vehicular access to some areas will reduce options for method of logging in areas. Some portions of the project area will be inaccessible to harvest, as landings suitable to helicopter operations will not be available.

Long-term Impacts: Direct and Indirect

Average, minimum rotation ages would be similar to those of Alternative 1, age 60. The average site index of lands available for harvest would be slightly reduced. Stands dominant with Douglas-fir will continue to be maintained. The availability of red alder of commercial size will decrease over time and stands with higher levels of hemlock and cedar will increase.

Cumulative Impacts

Cumulative impacts to Forest Resources are shown in the table below.

Table 17: Timber Resources - Cumulative impacts of each alternative.

	Alternative 1	**Alternative 2**	Alternative 3	Alternative 4	Alternative 5
Available acres for harvest or restoration activities	11,222	8,016	5,133	3,740	2,044
Percent of 15,657-acre planning area	72	51	33	24	13
Draft average annual harvest per decade (mbf/year)	5,511	2,733	492	428	N/A
Draft average Harvest Volume (mbf/acre)	37	30	9	16	N/A
Draft annual acreage treated as regeneration harvests	89	43	0	0	N/A
Draft average annual acreage treated as thinning harvests	47	35	18	16	N/A
Draft annual average acreage treated as partial cut harvests	11	13	11	9	N/A

Additional Mitigation Measures
None identified.

Unavoidable Adverse Impacts
N/A

Special Forest Products

Short-term Impacts: Direct and Indirect

This option provides reasonable access to a large part of the planning area for commercial harvesting of special forest products, but less so than the No-Action Alternative.

Long-term Impacts: Direct and Indirect

Although Alternative 1 affords the greatest variety in terms of stands in different age class and vegetative structures, this alternative provides sufficient differentiation in stand types so that the availability of products should be similar to that under Alternative 1. Roughly half the project area would be closed to harvest allowing vegetation and fungal species associated with late seral forests to develop. Areas open to harvest would produce products associated with higher levels of sunlight and open ground.

Cumulative Impacts

No significant adverse ecological impacts expected, as long as intensity and frequency of harvest is effectively managed.

Additional Mitigation Measures

Same as Alternative 1.

Unavoidable Adverse Impacts

Possible conflicts with Native American traditional uses of medicinal plants may impact any commercial harvesting.

Conservation/Preservation (carbon sequestration)

Same as Alternative 1.

Built Environment (4.3.2)

ENVIRONMENTAL HEALTH (4.3.2.1)

Release of Toxics/Hazardous Materials

No significant adverse impacts likely.

Risk of Explosion/Fires

The risk of explosion is unchanged compared to Alternative 1. However, reduced harvest activity could result in additional forest density, which can be associated with greater risk of forest disease and insect damage. These conditions could increase fuels in the forest though they would not in themselves increase the risk of fire starts. The risk of human caused fires is likely to be similar to the level anticipated in Alternative 1, since reduced harvest activity and the related reduction in roads would most likely result in similar or lower dispersed recreational use levels and patterns.

Risk of Slides, Floods, Debris Flows

Short-term Impacts: Direct and Indirect

The potential for short-term impacts to the built environment under Alternative 2, like Alternative 1, is minimal. The potential for localized impacts to forest roads in the vicinity of forest road construction projects

would be reduced under this alternative because fewer road miles will occur on unstable or potentially unstable slopes.

Long-term Impacts: Direct and Indirect

The potential for damage to the built environment resulting from management activities under Alternative 2 is minimal. There is some risk potential impacts to the natural environment are already discussed under "Earth."

Cumulative Impacts

Same as Alternative 1. However, the number of road miles associated with unstable or potentially unstable slopes is reduced, which reduces the number of road miles at risk of damage.

Additional Mitigation Measures

Same as Alternative 1.

Unavoidable Adverse Impacts

Same as Alternative 1.

Spiritual & Emotional Health

No known impacts. See "Affected Environment" discussion.

LAND & SHORELINE USE (4.3.2.2)

Existing Land Use Plans/Growth Estimates

No change from Alternative 1.

Residential and commercial development

No change from Alternative 1.

Aesthetics

All five alternatives include an objective to "reduce the visual impact of forest management activities in high visibility areas as shown on Map S-1" (See Appendix C.) In addition, many citizens raised the question of visual impacts in their scoping comments. This analysis looks primarily at those areas identified as having "high" and "medium" potential for visual impacts as viewed from six different residential communities.

Short- and Long-term Impacts: Direct

Because many harvest activities relative to potentially unstable slopes, will be determined site-by-site rather than by a set prescription, it is difficult to predict if there will be more or less harvest activity in those areas under Alternative 2 than under Alternative 1. Areas already determined unstable will be about the same. So this factor will either reduce or have similar visual impacts.

Alternative 2 likely will have slightly less risk of visual impacts due to the addition of riparian buffers on Type 5 streams. This will add more visual complexity to the distribution of trees, softening the look of the harvest area on the hillsides.

While the above statements are generally true, one area of moderate visibility (southwest of Sudden Valley on Map S-1) and one area of high visibility (north of Smith Creek on Map S-1) will have similar levels of visual impacts as Alternative 1 since unstable slopes protection and riparian buffering patterns will be similar. However, Type 5 stream buffering should reduce this to some extent.

Cumulative Impacts

Due to the dynamic nature of the forest re-growing, the limits on harvest size and buffers between harvest areas, and the addition of type 5 riparian buffers, the cumulative impacts should be even less under Alternative 2.

Additional Mitigation Measures

As in Alternative 1, sale design strategies could be used to soften the visual impacts of harvest areas, particularly in the high visibility areas. This would be especially important in the two areas noted above.

Unavoidable Adverse Impacts

Because aesthetics are subjective, not objective, it is difficult to say that no one will experience what he or she considers significant impacts. It is the determination here, however, that there will be no significant adverse impacts, particularly if mitigation actions noted above are used

Recreation

All the alternatives are based on an objective to "manage dispersed, low-impact recreation.

Short- and Long-term Impacts: Direct

Access throughout the area by recreational users (horse rider, hiker, mountain biker) will likely to be slightly diminished due a reduction of roads.

With larger areas that are not harvested for timber, there will be less evidence of human impact. For most users this would be an enhancement of their recreational experience particularly, recreation user involved in activities such as bird watching or berry or mushroom picking.

Due to expected amount of roads, both active and abandoned, it is expected that recreation use will be dispersed throughout the forest. The level of impact created by recreational users on streams, wetlands and other public resources is not expected to increase.

The amount of enforcement, particularly to discourage off-road vehicle use is not expected to increase; access to major forest road systems is currently blocked by gates in cooperation with other major landowners.

Historic & Cultural Preservation

The cultural resource objectives and strategies for Alternative 2 are the same as Alternative 1. This alternative also relies on the department more fully establishing a cultural resources program. An estimated 95 percent of cultural resources in the Lake Whatcom watershed could be identified, evaluated, and protected through a Section 106 like process.

However, the additional protection of riparian and wetland areas and reduction of roads will reduce the potential short- and long-term impacts to ritual bathing, spirit quest and traditional song places, ceremonial flora/medicine sites, and gear storage sites (see table under Alternative 1).

Agriculture

No change from Alternative 1. There are no lands specifically designated for long-term agricultural use within the planning area, though it is a permitted use for lands in Whatcom County zoned rural and rural residential.

Silviculture

Under this alternative, approximately half the project area will be eligible for commercial harvest. This alternative does not vary significantly from Alternative 1 regarding the ability of the department to conduct silvicultural activities on available acres.

Regeneration of stands will continue to emphasize current practices of artificial regeneration of Douglas-fir and western red cedar. Natural seeding will be utilized at higher elevations. Aggressive brush control will occur during the first ten years. Similar to Alternative 1, the snag and green tree requirements under this alternative can adversely impact the ability to conduct aerial applications of pesticides or fertilizer if the location of trees and snags within a unit compromises the safety of helicopter operations.

Precommercial thinning will probably be employed on all stands. The probability of acceptable rates of return from commercial thinnings is high. Some reductions in road access will increase overall costs of silviculture treatments.

Short- and Long-term Impacts: Direct and Indirect

No significant adverse impacts are expected on the department's ability to use effective silvicultural techniques to achieve the landscape objectives

Cumulative Impacts

The ability to control stand structure, stand composition and density, control rotation length and facilitate harvesting on available acres will be very high under this alternative but less than Alternative 1.

Additional Mitigation Measures

After a review of each site, the department selects from the following methods for controlling vegetation: no treatment, non-herbicide, ground-applied herbicide, and aerial applied herbicide. A method lower on the list may be used only if it substantially outperforms other methods (Forest Resource Plan Policy # 33).

Aggregated, rather than dispersed, patterns of retention increase flexibility in treatment of young stands and reduction in windthrow.

Unavoidable Adverse Impacts

The potential environmental impacts of various silvicultural approaches are covered under the "Natural Environment" topics. Since these alternatives are policy issues, none of the limitations on silvicultural tools are unavoidable.

TRANSPORTATION (4.3.2.3)

Transportation Systems

If it took 60 years to complete a first harvest on all available stands under this alternative, about 7 miles of new roads would be built in the first decade.

Approximately 39 miles of road would be constructed overall to complete the transportation system for commercial forestry. The combination of log and rock haul would result in an average of 8 truck trips per day generated by forest management activities on DNR forests in the watershed. This number reflects two passes for each truck on a round trip and assumes that work occurs every Monday through Friday. In reality these trips would be condensed over space and time based on actual road construction and harvest activities. But these numbers are used for comparative purposes.

Easements for neighboring landowners might be prohibited or require longer road construction if unstable slopes were encountered.

Mitigation measures would be similar to those in alternative 1. No new road construction on unstable slopes eliminates the potential for maintenance or special design requirements in those areas.

Review of potentially unstable slopes by a specialist would likely reduce long-term maintenance needs.

Short-and Long-term Impacts; Cumulative Effects

Possible environmental impacts are discussed in other sections under "Natural Environment". No significant impacts are expected related to maintenance or traffic. Alternative 2 may result in a less efficient road system and may limit DNR's ability to access some areas by vehicles for harvest (impacting the trust revenues), immediate fire suppression, and recreational users.

Additional Mitigation Measures

None identified.

Unavoidable Adverse Impacts

Unavoidable adverse impacts will be similar to Alternative 1, although the impacts will be proportionally smaller due to fewer miles of road construction.

Forest Road Maintenance and Abandonment Plans

DNR expects to complete the assessment phase of the Road Maintenance and Abandonment Plan within one year after the landscape plan is adopted. Funding has been appropriated to do the necessary maintenance and abandonment work. Assuming continued funding, DNR expects to complete the work within three years after completion of the assessment phase of the RMAP. The requirements for treatment of orphaned roads are also the same as Alternative 1.

Short- and Long-term Impacts

Same as Alternative 1.

Cumulative Effects

The road system requirements under Alternative 2, taken in combination with unstable slopes and riparian areas differences, would have cumulative benefits to the environment, particularly fish habitat. Alternative 2 will also increase the demands on management funds, which may limit the department's ability to do other critical work in this landscape or elsewhere in the state.

Additional Mitigation Measures

None identified.

Unavoidable Adverse Impacts
None identified.

Traffic Hazards/Safety

The amount of hauling under Alternative 2 is nearly half the average under Alternative 1 (averaging 8/day rather than 15/day). Actual hauling events will tend to be more concentrated when specific road building and harvest activities is occurring, with almost no hauling at other times or in other parts of the landscape. No significant adverse impacts relative to traffic and safety are expected.

Water, Rail and Air Traffic

There is no significant change from Alternative 1. Harvest levels will be lower, but road access will also be more limited, so there may be some increase in helicopter logging of DNR-managed lands.

PUBLIC SERVICES & UTILITIES (4.3.2.4)

Relation to Trust Income

Alternative 2 dedicates 75 percent of the land's productive capacity for ecological and social benefits (Hulsey, 2002). For the percent of acres constrained relative to timber harvest for each trust under each alternative, see the graph under "Relation to Trust Income" in Alternative 1.

A financial analysis of the preliminary draft sustainable harvest calculations for Lake Whatcom suggests that, in present value terms, Alternative 2 will return between $542,000 per year and $621,000 per year less than Alternative 1 (to the state general fund for public services and the direct support of county junior

taxing districts, and the department's management fund), depending on the annual real discount rate (which ranged from 4% to 10% in the analysis (Glass, 2002).[2]

Analysis was completed for carbon sequestration, green certification and recreation leasing:

Carbon sequestration: Based on the assumptions of the comparative analysis, the breakeven values of additional carbon sequestered under Alternative 2 are likely to be very high compared with deliberately planting bare land for carbon sequestration purposes. This prospect means returns for carbon sequestered in the Lake Whatcom landscape (if any) would probably not produce revenues sufficient to financially justify this choice, since other means of producing carbon for sequestration are likely to be available at substantially lower cost (Glass, 2002).

Green certification: Whether or not certified lumber products attract a premium price in the market, any price premium associated with certified softwood lumber would have to return at least $99/mbf to the forest grower, in order to financially justify choosing Alternative 2 over Alternative 1, because of the reduced timber harvest. It appears highly unlikely that forest growers will realize price premiums of this magnitude, especially within the context of current lumber and stumpage prices. (Glass, 2002).

Recreation leasing: None of the alternatives proposes a destination resort on state trust lands near the shores of Lake Whatcom. However, because this would generate some of the highest recreation returns, it was used as a test case, to see if recreation income could effectively offset reductions in timber revenues. Estimated lease revenues from a hypothesized destination resort development on the shores of Lake Whatcom are unlikely to completely offset timber harvest revenues forgone under Alternative 2. (Glass, 2002).

Finally, it appears highly unlikely that combined revenues from carbon sequestration, certified lumber production, and leasing of trust land for recreation activities could financially justify the choice of Alternative 2 over Alternative 1. (Glass, 2002)

Fire

Risk unchanged from Alternative 1 (which is low). If wildfire does occur, short-term direct impacts of fire on DNR-managed lands include damage to the forest itself, risk of damage to neighboring properties, loss of habitat and potentially increased risks to water quality. In both the short and long term fires pose potential loss of trust assets in the form of timber and other forest products as well as soil productivity, and the associated reduction in actual income and income

[2] These results include only timber revenues captured by the department, and are based on an analysis that assumed the services of the land were obtained for no cost. Therefore the results should be interpreted as a financial analysis rather than either an economic or benefit-cost analysis.

potential for the federally granted trusts and counties. Fire damage also could negatively affect aesthetics, both from the standpoint of views and through diminished desirability of the Lake Whatcom area for recreational use. Reduced income as a result of fires could affect the amount distributed to local fire districts from harvests on Forest Board lands.

Police

No change from Alternative 1.

Schools

Reduced timber harvest level would result in a lower level of contribution to the Common School Construction Account and reduced revenue to the state general fund, which could reduce the amount of legislative funding available for other education related needs.

Parks & Recreation facilities

Same as Alternative 1.

Communications

Will not impact communication sites leases, nor limit new site opportunities.

Water/storm water management

Not applicable

Sewer/solid waste management

No change from Alternative 1.

Since most DNR-managed lands in the planning area are designated for commercial forest uses there has been no need for sewer or wastewater planning. Likewise, because of the non-residential uses of these lands, solid waste management needs have been limited to cleanup of unauthorized dumping.

Other government services or utilities

Not applicable.